

Assessing the Effect of Five Gasoline Properties on Exhaust Emissions from Light-Duty Vehicles certified to Tier-2 Standards

Analysis of Data from EPA Phase 3

(EPAct/V2/E-89)

Appendix L.4

Model Fitting Information for

Formaldehyde (Bag 2)

This appendix summarizes model fitting for Bag-2 Formaldehyde. Model-fitting techniques and approaches are summarized in Section 8.7. Features of the data and modeling for this compound are listed below.

Media contamination: YES

No. measurements: 63

No. censored values: 1

Modeling approach: MIXED MODEL

Estimated Dependent Variable model: YES

Models fit for Bag-2 Formaldehyde

Model term	Notation	Model				
		Full	FM1 ¹	FM2	FM3	Null model ²
etOH	Z_e	•	•	•	•	×
Arom	Z_a	•	×			
T50	Z_5	•	•	×		
T90	Z_9	•	•	•	×	

¹ Indicates “Full minus 1,” etc.

² Indicates model with intercept only, no fuel parameters.

Fitting history for Bag-2 Formaldehyde – with “FM2” selected as best fit model.

Fit Parameters				Test with respect to Full			Test with respect to Previous Model		
Model	p	-2lnL	BIC ¹	Dev. ¹	d	$\text{Pr}>\chi^2$	Dev.	d	$\text{Pr}>\chi^2$
Full	5	70.37	81.64						
FM1	4	70.47	80.12	0.09329	1	0.76			
FM2	3	70.61	78.66	0.2340	2	0.87	0.1467	1	0.70
FM3	2	73.29	79.73	2.922	3	0.40	2.682	1	0.10
Null model	1	76.19	81.02	5.821	4	0.21	2.900	1	0.09
¹ A lower value indicates a better fit.				¹ The deviation is the difference in the -2loglik statistics for the nested and reference models, respectively, per Equation 14.					

Coefficients and Type-III Tests of Effect for the Full and Best-Fit Models – Formaldehyde (Bag 2).

Effect	Full Model					Best-Fit Model (FM2)				
	Estimate	Std.Err.	d.f.	t -value	$\text{Pr}>t$	Estimate	Std.Err.	d.f.	t -value	$\text{Pr}>t$
Intercept	-8.6574	0.1372	5.01	-63.10	<0.00001	-8.6574	0.1375	5.01	-62.97	<0.00001
Z_e	0.08456	0.05937	58.04	1.424	0.16	0.07804	0.05011	58.08	1.56	0.125
Z_a	0.01575	0.05154	58.05	0.306	0.76					
Z_5	0.01863	0.05815	58.03	0.320	0.75					
Z_9	-0.08138	0.05031	58.16	-1.62	0.11	-0.08322	-0.8322	58.15	-1.65	0.103
σ_{veh}^2	0.08205					0.08239				
σ_{ε}^2	0.3762					0.3776				